

Classification of Human Reflexes

ILOs:

By the end of this lecture the student will be able to:

- Classify human reflexes
- Explain each one
- Explain the character and clinical significance of each
- Classify spinal reflexes
- Explain each

Types of reflex arc:

1. **Monosynaptic:** i.e. no interneurons as the afferent synapses directly with the efferent fiber. So, the central delay is minimal e.g. the stretch reflex.
2. **Disynaptic :** contain only one interneuron between afferent and efferent nerve fiber. E.g. inverse stretch reflex.
3. **Polysynaptic:** i.e. interneurons are present between the afferent and the efferent fibers e.g. most of the body reflexes.

Human Reflexes are **Central Reflexes that are** classified into:

a) **Conditioned Reflexes** that are acquired after birth, needs *education & training* and integrated in the ***cerebral cortex***.

b) **Unconditioned Reflexes** are inborn reflexes (dating since birth). Their centers are below the level of the cortex including:

1. **Hypothalamic Reflexes** that regulate many functions e.g. body temperature, H₂O balance, glucose balance.....

2. Brain stem Reflexes: that regulate postural, visual, respiratory, digestive and cardiovascular functions.

3. Spinal Reflexes which may be either superficial, deep or visceral spinal reflexes.

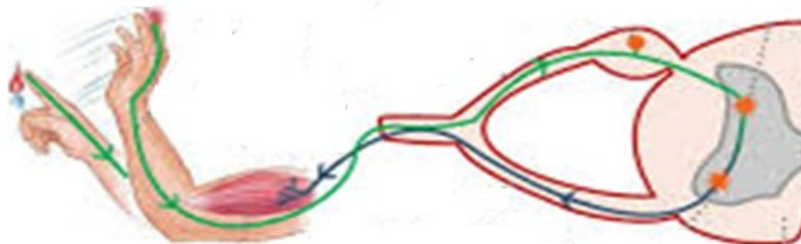
A) Superficial Spinal Reflexes

These reflexes appear by stimulation of the cutaneous receptors.

1. Withdrawal reflex (flexor reflex, nociceptive reflex):

- ✓ This is a protective and prepotent reflex (inhibits other reflexes).
- ✓ Stimulus: noxious stimulus to skin of one limb or one part of body.
- ✓ Afferent nerve: A δ and C nerve fibers (pain afferents).
- ✓ Efferents: alpha motor neuron to skeletal muscle.
- ✓ Response: depend on degree of painful stimulation:
 - reflex contraction of flexors to withdraw the limb away from the stimulus.
 - Parts of body other than limbs can elicit withdrawal reflex involving complex pattern other than contraction of flexors.
 - Up to moving the whole body from the cause of pain
- ✓ Centre: according to stimulated muscle
- ✓ Function: the integrative centers of the cord cause the muscles to contract that can most effectively remove the pained or irritated part of the body away from the object causing the pain or irritation.

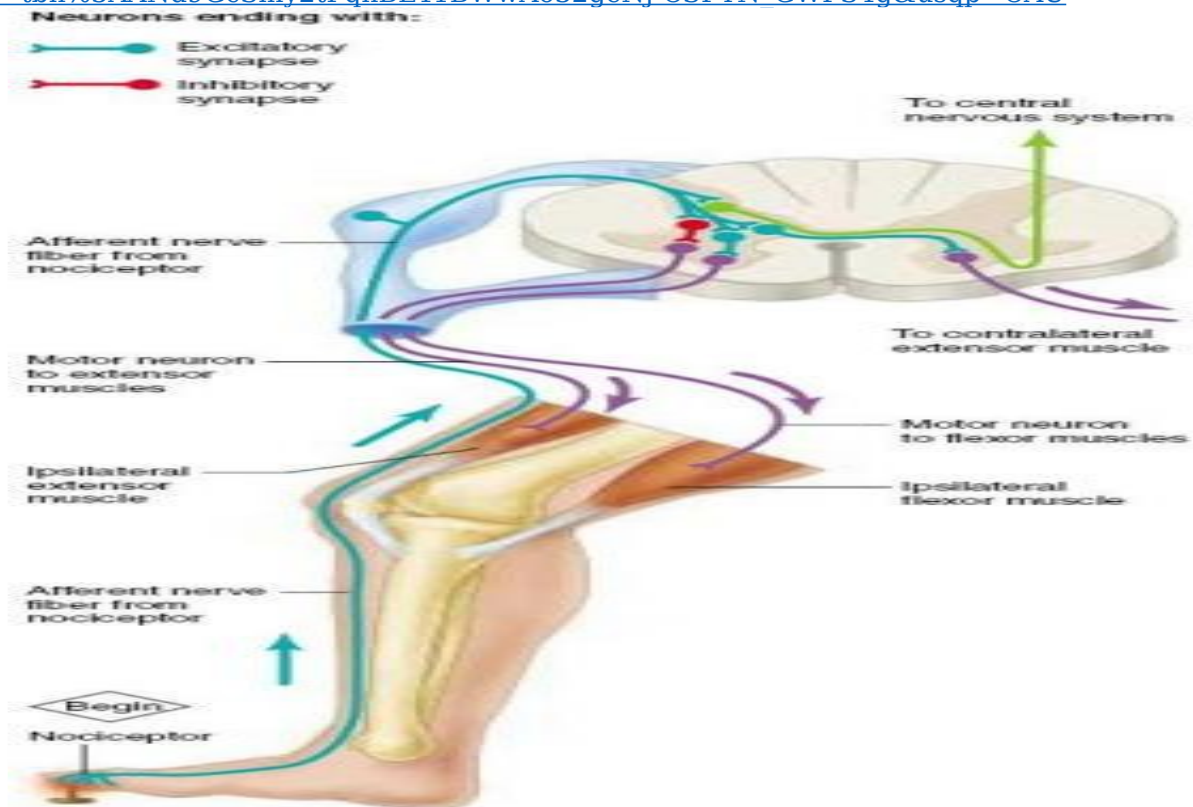
- ✓ It is a polysynaptic reflex that is characterized by irradiation, reverberating circuits, reciprocal inhibition and after discharge.



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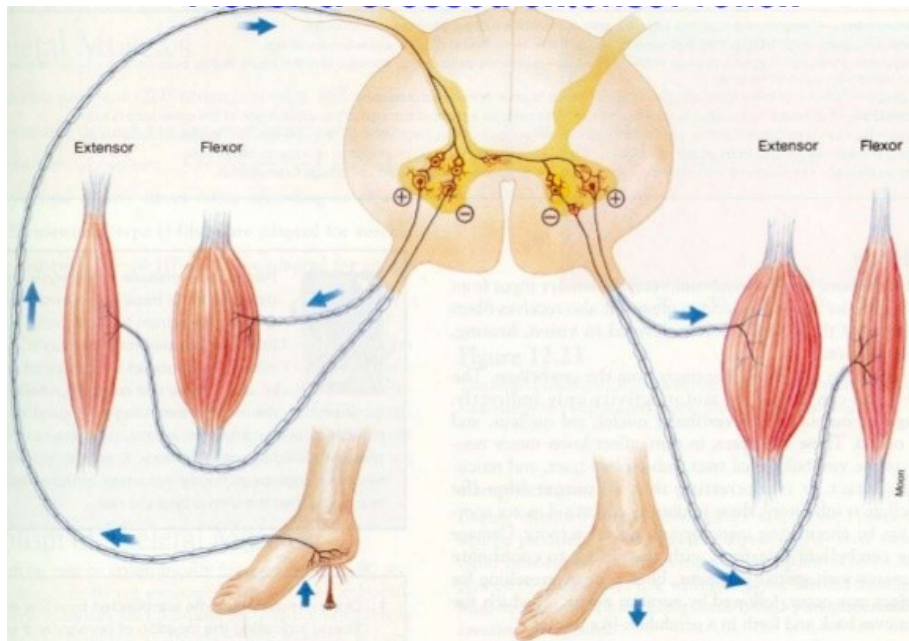
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2. **Crossed extensor reflex**

- ✓ Stimulus : Strong noxious stimulus of one limb
- ✓ Afferent nerve: A δ and C nerve fibers (pain afferents).

- ✓ Efferent: alpha motor neuron to extensor muscles of opposite side.
- ✓ Response : reflex extension of opposite limb (as a result of withdrawal reflex).
- ✓ Center: motor neuron pool of affected muscle stimulated by intersegmental neurons.
- ✓ It is polysynaptic reflex that follow withdrawal reflex with longer latent period and long after discharge.



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3. **Positive supporting Reflex (reaction):**

- ✓ Stimulus: Deep pressure on the sole foot (by the body weight during standing)

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- ✓ **Stimulus:** scratching the lateral side of the sole from below upwards and then medially leads to plantar flexion of toes.
- ✓ **Response:** planter flexion of the toes.
- ✓ **Abnormal response :** dorsiflexion of big toe and fanning of other toes. This is named positive Babiniski sign.
- ✓ Center: S1–2
- ✓ The abnormal form (positive Babiniski sign) is present in:
 - some physiological conditions (pseudo positive Babiniski sign) such as:

* Newly born infants (below 1 year) due to lack of myelination of the tracts

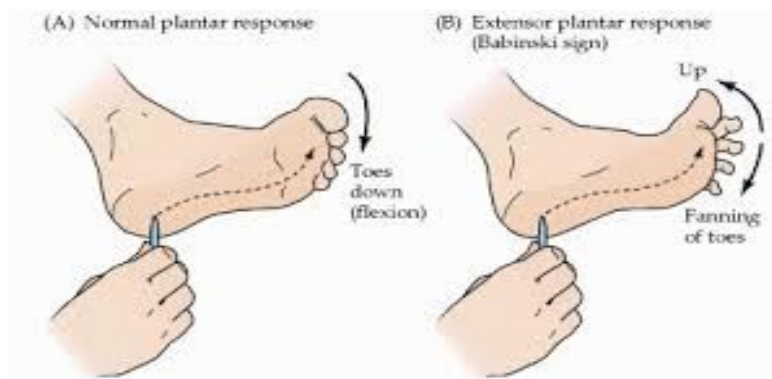
* Deep sleep

* General anesthesia

➤ Pathological conditions :

* Coma

*Upper motor neuron lesion. : Partial positive babinski sign : dorsiflexion of big toe (area 4 lesion) or fanning of other toes (area 6



lesion).



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5. Abdominal reflexes :

- ✓ **Stimulus:** Scratching of the abdominal skin by blunt object.
- ✓ **Response:** Contraction of the abdominal muscles as indicated by movement of the umbilicus in opposite direction to scratch (*type of withdrawal reflex*). Intact pyramidal tract is needed for its appearance>
- ✓ **Abnormality:** it needs intact upper motor neuron to function so it is usually lost in upper motor neuron lesion (UMNL).
- ✓ **Center:** T7–12



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6. Cremasteric reflex:

- ✓ **Stimulus:** Scratching the skin of the inner aspect of the thigh in males.
- ✓ **Response:** Contraction of the cremastic muscle and elevation of the testis.
- ✓ **Center:** L1–2

7. Anal reflex :

- ✓ **Stimulus:** scratching the skin around the anus.

- ✓ Response: contraction of external anal sphincter.
- ✓ Centre: **S3–4**

8. **Scratch reflex:**

- ✓ Stimulus: Itching sensation due to multiple linear tactile stimuli (by crawling insect).
- ✓ Response: to and fro scratching movement.

N.B. *Corneal reflex is a protective superficial reflex, the afferent is trigeminal nerve (V) and the efferent is facial nerve (VII).*

B) Deep (Proprioceptive) Spinal Reflexes

1. Stretch Reflex: mentioned later.
2. Inverse stretch reflex: mentioned later.

C)Visceral (Autonomic) Reflexes

1. Micturition and defecation Reflexes: **S 2-4:**
2. Erection **S 2-4**
3. Cold pressor effect (exposure of the skin to cold leads to VC)
4. Peritoneal irritation leads to relaxation of GIT wall (paralytic ileus)